Evaluation of the Alabama *One Health Record*® Health Information Exchange Interim Report

Prepared by: Stephen T. Mennemeyer Ph.D
Sally Engler
Siddharth Jain, MBBS, MPH
Department of Health Care Organization and Policy
School of Public Health
University of Alabama at Birmingham
Birmingham, Alabama 35294-0022

Prepared for: Office of the National Coordinator for Health Informatics
U.S. Department of Health and Human Services

Submitted to: Gary D. Parker, MBA, JD
Director, Health Information Technology
Alabama's HIE, *One Health Record*®

Alabama Medicaid Agency
501 Dexter Avenue
Montgomery, Alabama 36103
gary.parker@medicaid.alabama.gov

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Executive Summary

The State of Alabama is in the process of establishing the Alabama Health Information Exchange (AHIE) called *One Health Record*®. This is a computer information system that will allow physicians, hospitals, pharmacies, clinical laboratories and other health providers to share historical and up-to-date clinical information about their patients. (We use the terms One Health Record and AHIE synonymously throughout this report). Anticipated benefits of the AHIE include better care in emergency situations, avoidance of duplicate tests, better detection of allergies and contraindicated medications and improved communication among patients and health care providers. The Alabama Medicaid Agency has been designated by the Governor of Alabama as the organization to operate the AHIE. Funding for roughly the first three years of development and operations has been provided by the Office of the National Coordinator for under the authority of the provisions of the HITECH act.

The Department of Health Care Organization and Policy (HCOP or ”we” throughout this report) in the School of Public Health at the University of Alabama at Birmingham (UAB) is under contract to the Alabama Medicaid Agency to conduct an objective evaluation of the performance of the AHIE. HCOP is distinct a distinct part of the UAB, separate from the UAB Health System and UAB Hospital. This report is the interim evaluation report. It describes the process of starting up the AHIE and its progress to date at becoming operational. A final report in the Spring of 2014 will evaluate the achievements of the system.

For this interim report, HCOP examined various documents related to the plan for One Health Record. We interviewed key personnel at hospitals that are close to going

live onto the system. We interviewed the program manager of Truven, the contractor that is supplying and hosting the AHIE software platform. We also examined data from the Surescripts system to learn about the extent of e-prescribing. To learn about the electronic exchange of information among clinical laboratories, we examined the results of lab surveys commissioned by Alabama Medicaid and we examined databases maintained by CDC. We had originally planned for this report to interview physicians' practices and vendors who sell and service Electronic Health Records. Due to some progress delays at activating One Health Record, we have postponed these interviews. Our findings are as follows.

Alabama Medicaid has successfully procured a software platform from Truven Health Analytics for hosting the system. It has also acquired additional software for analyzing and creating reports on healthcare utilization, patient demographics and technical aspects of system utilization. In regard to what ONC has designated as Program Priority Area 3 (PPA3), the exchange of clinical information among providers, *One Health Record* as of the Spring 2013, has succeeded in loading essential data files that identify providers and patients and it has half a dozen hospitals in the final stages of exchanging test data with the system. The pace of implementation is several months behind its original plan and this slower pace appears to be due to the following:

- Various providers have taken longer than expected to work out the rules in their own systems for sharing data with the AHIE. This has been especially complicated for hospitals in relation to affiliated physician practices.
- Some EHR venders have been slow at developing connections between their products and the AHIE. Some of this slowness seems to be due to technical challenges and some to competing business priorities regarding software development.
- Alabama, to its credit, elected to create a system that emphasized the exchange of structured data among all providers rather than FAX-like images of data. This

decision has increased development time but should permit better integration and retrieval of longitudinal information in the system.

In regard to ONC's PPA2, pharmacy participation in e-prescribing, steady progress has been made toward near universal participation. According to data provided by Surescripts, in 2012, 94% of Alabama pharmacies had activated e-prescribing and 68% of physicians were routing prescriptions electronically. Physician use of e-prescribing is expected to continue to grow because more physicians are moving to adopt EHRs partly in response to HITECH incentives.

In regard to ONC's PPA1, laboratory participation in delivering electronically structured results, licensure records maintained by the Centers for Disease Control and Prevention (CDC) show that there are 161 hospital and 130 independent clinical laboratories in Alabama. Alabama Medicaid commissioned surveys of these laboratories in 2011 and 2012 to determine their electronic information exchange capabilities. Both survey efforts had low response rates making it difficult to determine electronic capabilities throughout the state. One problem may be that the survey contractors were working with contact lists that were less comprehensive than the CDC's. Another problem is that individual laboratories may not have personnel who can knowledgeably respond to questions about the details of electronic information exchange, especially regarding formats such as LOINC or HL7. The CDC licenses distinct physical facilities but many of the independent labs are owned and operated by a national or regional company. A local lab manager may have a rough idea of how much test information is exchanged with providers via mail, courier, FAX or a computer link but exactly what protocols are used is knowledge that is more likely to reside at

corporate headquarters. A revised survey strategy that focuses on finding the appropriate health information specialist may improve the quality and utility of survey information. It may also be more efficient to have the State Health Department agency that inspects clinical laboratories ask about electronic transmission capabilities during the course of routine inspections that occur approximately every two years. This approach would cover many labs that do tests of high to moderate complexity but it would miss those Accredited laboratories that do high complexity tests which are inspected by one of 6 national accrediting agencies. Information on those laboratories could be more efficiently collected by ONC working directly with those agencies. It should be noted that ONC has recently commissioned its national evaluation contractor NORC to conduct a statistically valid sample survey of 12,000 hospital and independent clinical laboratories. We believe that a periodic national survey with a sufficient sample size to make state level estimates would more efficiently provide ONC with what it wants to know.

1. AHIE Design and Current State

The State of Alabama is currently implementing **One Health Record®**, a network that will allow Eligible Hospitals (EHs) and Eligible Professionals (EPs) – hospitals, physicians, pharmacies, laboratories, etc. – to share longitudinal information about their patients in order to aid clinical decision-making. Patients will also be able to access their own health records. The implementation of the exchange is being led in the State by the Alabama Medicaid Agency in cooperation with many other health care providers and payers. Alabama's efforts are part of a national program to create Health Information Exchanges (HIEs) in every state and to eventually link the exchanges to a national network. The development of these exchanges was catalyzed by the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 which provides Federal development funds through the Office of the National Coordinator (ONC) in the Department of Health and Human Services.

The main purpose of the Alabama **One Health Record®** is to aid clinical decision-making by giving a provider essential clinical information about a patient's medical history. This should improve continuity of care and help in avoiding errors and reduce waste due to unnecessary duplication of services. For example, the exchange would allow an emergency physician to view information from the medical record of a trauma patient arriving at the hospital. It would allow a pharmacist to check a patient's prescription against whatever other drugs she might be taking to avoid drug mismatches. It would allow one physician to view X-rays or other diagnostic images and reports recently ordered by another referring physician. The extent of these benefits depends on having as many health care providers – hospitals, labs, pharmacies and

health professionals as possible in a network that operates rapidly while assuring the security and confidentiality of its data.

In order to participate in One Health Record®, providers will optimally have their own electronic health record (EHR) although they may use Direct Secure Messaging (DSM) for some communications with other providers[1] [2]. Technical assistance to help providers select and install an EHR and to connect to the AHIE is being provided in Alabama by a Regional Extension Center (REC) located at the University of South Alabama. Financial incentives are available through the HITECH Act to encourage providers to adopt EHRs and to undertake the meaningful use (MU) of them. During 2012 through 2014, physicians who adopt EHRs and meaningfully use them can receive incentive payments of as much as $44,000 from Medicare or $63,750 from Medicaid; participating hospitals can qualify for payments starting at $2 million which could increase based on a formula that includes higher payments for large volume caseloads of Medicare or Medicaid patients.[3] For 2015 and later, Medicare EPs, EHs and critical access hospitals (CAHs) that do not successfully demonstrate meaningful use will have a payment adjustment in their Medicare reimbursement. Successful implementation of One Health Record® will crucially depend on the breadth and quality of data that providers can offer it from their own EMRs and EHRs. The One Health Record® project is led by the State's Medicaid Agency which is providing administrative and financial support.

The HCOP evaluation team recognizes the complexity of the AHIE Cooperative Agreement Program and our evaluation of it includes both qualitative and quantitative methods to examine its many components. Our approach focuses on the process of

implementing and using the system including how the system was designed to operate, how well the system has stayed on schedule for meeting its operational goals, how vendors have performed, and how satisfied providers are with using the system. We discuss lessons learned throughout the report.

History of HIE development

Prior to its current efforts with developing One Health Record, Alabama had developed a somewhat limited health information exchange. [4] Starting in January 2007, the Agency used a Medicaid Transformation Grant (MTG) to establish a basic HIE known as *Together for Quality*. As a result, Alabama had a web-based system that compiled claims-based information from both Alabama Medicaid and Blue Cross and Blue Shield of Alabama as well as certain physician-entered clinical information. This information was available through an end use application known as Q-Tool or through unidirectional CCD exchange. Alabama's system was a hybrid model, with Medicaid data centralized and other data sources pulled in at the time of query. The claims-based information was overlaid with clinical alerts indicating missed opportunities based on national evidence-based standards of care. For example, physicians were "reminded" that diabetic patients needed eye and foot exams or that asthma patients were seeking care in the emergency room or not taking medications appropriately. E-prescribing, including prescription history, electronic refill requests and history of fill status, with this information being available to physicians. In addition to clinical information, Medicaid eligibility information, including managed care (Patient 1st) assignment and benefit utilization, was available. Q-Tool was offered to our providers at no cost and since it was web-based there was no special hardware or software required.

Because Q-Tool was developed with Medicaid Transformation Grant dollars, it was initially implemented in only nine pilot counties to determine the impact that having electronic information would have on patients with diabetes and/or asthma. In October 2009, the State began working with providers outside the pilot counties. As of January 5, 2011, there were 193 locations enrolled, representing approximately 350+ providers. There was unidirectional exchange with four EMR vendor products which displayed the information through CCD view to approximately 113 locations representing 250 providers. Work was continuing to establish connection with additional EMR companies as well as a pilot that would allow for multi-directional exchange. In issuing the RFP for a contractor to provide software and hosting services for One Health record, it was envisioned that the end use of Q-Tool would phase out as the new statewide exchange became operational.

Throughout Alabama, medical facilities (e.g. hospitals) had also developed some limited levels of data exchange. Most of these entailed linking their internal systems, and in some isolated cases involved hospitals exchanging data with physicians who were part of their system. To the best of Medicaid's knowledge, there are no "systems" in Alabama communicating with other "systems" outside their own medical community, nor were there any functioning regional health information organizations (RHIO's), though at least one was underway. The initial goal of the new AHIE was to provide for basic exchange through the enablement of a provider directory and secure messaging.

AHIE Platform Acquisition

On March 18, 2011 the Alabama Medicaid Agency issued a Request for Proposal (RFP) for the "Development and Operation" of the AHIE. After evaluating the

bids, Medicaid awarded a contract to Thomson Reuters in 2011 for its HIE Advantage product. Subsequently Thomson Reuters sold its health care division to an investor group that now operates under the name Truven Health Analytics. (http://www.truvenhealth.com/default.aspx) Hereafter, we will use the Truven name through this report unless clarity requires a specific reference to Thomson Reuters.

The RFP called for a vendor (with possible subcontractors) that would provide technical support, software, and computer hosting facilities for five years.[4] The vendor had to have demonstrated involvement in at least one completed HIE. Specifications required that the AHIE would be able to interconnect all hospitals and physicians that used EHRs or EMRs, e-prescribing pharmacies, clinical laboratories and various state health agencies including Medicaid, Mental Health, the Alabama Department of Public Health and an existing data warehouse that mainly held Medicaid claims. The AHIE was specified to be a federated model, where data would reside with the individual provider, rather than a consolidated model where provider data is located in a centralized facility. Specifications were such that the AHIE would offer "low cost, simple tools (Core Service Components) to help providers achieve Meaningful Use". It would be able to quickly look up and assemble "one longitudinal patient record" about a specific patient in response to a provider's query. The Core Services Components would include support for a Provider Directory, Secure Messaging, a Master Person Index and a Record Locator Service. Clinical information exchanged from the provider level would be augmented with support for e-Prescribing, and Structured Laboratory Results. The AHIE would be complementary to and compatible with DIRECT and various national data standards and certifications including, but not limited to HL7, NCPDP, ASTM,

SNOMED CT, IHE integration profiles, LOINC, NWHIN, ICD10 and HITSP standards. The system architecture would be scalable and capable of supporting "a peak load of no fewer than 500 concurrent users and 25 requests per second." HCOP's discussion with a Truven senior manager indicated that the RFP was very clearly written and technically specific so that bidders with appropriate systems could write responsive proposals.

The RFP's timetable anticipated that the vendor would begin work in July of 2011. The Core System would be functionally complete and tested by December 2011. During 2012 the system would roll out across the state and "ramp on" the various providers via three geographically defined gateways so that the initial implementation would be complete by December 2012.

In selecting Truven, Alabama purchased a system that had already been implemented successfully in South Carolina and West Virginia. Although the Truven system is capable of supporting either a consolidated or federated model, both of these states operated under federated designs similar to what Alabama wanted and thus demonstrated that the Truven system would likely be adaptable to Alabama.

The Truven HIE Advantage product runs on software developed by CareEvolution, a privately held healthcare software developer with headquarters in Ann Arbor, Michigan (http://careevolution.com/index.html). CareEvolution markets software for HIEs and RHIOs under the trademark HIEBus™ which it advertises as an HL7 gateway with Service-Oriented Architecture (SOA) -based modules for "Identity Management, Security, Data Integration, Terminology Services, Performance and Scaling and Visualization and Integration." Basically, the company markets to two types

of customers. One customer is an HIE-designated entity, such as Alabama Medicaid, that wants to focus its resources on policy, administrative, operational, legal and analytical issues apart from designing and implementing the HIE network itself. A second customer is an EHR software vendor or an individual hospital, physician, clinical laboratory or other provider that wants to connect its EHR/EMR with an HIE network. For example, CareEvolution claims that its Terminology Service can read data from a clinical laboratory and translate the names that the lab uses for its tests into names that are generally recognized by the Unified Medical Language System® (UMLS) Metathesaurus® http://www.nlm.nih.gov/pubs/factsheets/umlsmeta.html of the National Library of Medicine (NLM).

In early 2013, Alabama Medicaid purchased Truven's HIE Advantage Analytics product which is designed to retrieve, assemble and analyze longitudinal data from an HIE network. Truven's web page states that after assembling data from various sources, their product "automatically applies clinical methodologies at a patient- and/or group level to identify specific chronic diseases and overall health status in the population and sub-populations, calculate clinical metrics, evaluate process of care, pinpoint areas of clinical concern, highlight opportunities to advance quality of care, and help you act on findings swiftly and with certainty. […] The platform also allows you to quantify clinical information exchange traffic (both query-based as well as direct messaging) over the network — easily demonstrating increased use of the system to government and public funding entities." The Analytics product thus offered Alabama Medicaid a convenient method for generating reports on population health and system utilization without having to employ a squadron of programmers and analysts internally.

As of this writing, the Analytics product is being installed and tested and should be available to track system statistics as the AHIE is rolled out across the state.

The relationship between Truven and CareEvolution is that the latter has written and will maintain the software for the AHIE. Truven's role is to market the CareEvolution software and provide technical support to AHIE. For the HIE Analytics product, in contrast, Truven writes and maintains its own software because it historically has focused its efforts on the development and analysis of healthcare information. The relationship between the two companies offers potentially powerful synergies and benefits from specialization. The risk in the relationship is that a deterioration of their business relationship could leave AHIE with fragmented service and deteriorating support. So far, the relationship and products appear to be working effectively for the AHIE.

HCOP conducted interviews with a Truven senior manager and with senior executives at several hospitals (hereafter designated A, B, C etc.) that were in the process of exchanging test data with the AHIE prior to going into live connects. One issue that emerged from these discussions was varied experiences in getting EMRs to communicate with the AHIE. Hospital A which used an EHR that had a central database that served all of the departments and facilities had found no substantial difficulties with exchanging test data with the AHIE. It believed that its nationally known EHR vendor had been diligent about building necessary software interfaces into its core product. Hospital B used an older EHR system with a modular set of databases that had been developed previously by hospital A's vendor. Hospital B reported that it needed to purchase some additional software from its vendor in order to successfully exchange

test data. Hospital C had an EMR, developed by a national vendor, that read data from different systems maintained by different parts of the hospital (lab, radiology, pharmacy) and by an affiliated group of physicians using an independent EHR. Hospital C stated that it had paid its EHR vendor to develop interface software that would meet the Patient Index Cross -referencing or PIX 3.0 standard. It was disappointed to find that the Truven HIE Advantage system developed by Care Evolution had adhered to an older PIX 2.5 standard that had some incompatibilities with Hospital C's PIX 3.0 software. Truven's comment to HCOP about this report was that Care Evolution was clear that it was using Pix 2.5 and it was cautious about adopting proposed or recently released communications standards until they had been thoroughly tested. HCOP interviewers could not determine if the communication difficulty encountered by Hospital C was due to an inherent incompatibility between the two versions of PIX or due to errors by Hospital C's vendor in writing code for the newer standard.

The **basic lesson** that emerges from HCOP's discussions with Truven and the hospitals is that EMR and EHR vendors vary in their diligence and ability at linking their systems with an HIE platform. In the few cases that HCOP has so far examined, large national vendors appear to build HIE compatibility into their EMR/EHR product while smaller regional vendors seem to give this issue less attention and may require their clients to pay for additional work in order to develop the HIE connection. This perception, however, is based on interviews with a very small non-random sample of hospitals and thus needs to be explored further as the AHIE goes live with more hospitals in the coming months.

A second issue that arose in HCOP's discussions concerned why the implementation timetable in the RFP had lagged by about 6 months. One reason for this was the common problem on many information system installations that code compatibility problems are difficult to predict and they often are encountered in sequence so that one problem is not discovered until another has been fixed.

In this discussion, HCOP also asked about a Truven press release which announced that a similar Truven West Virginia (WV) HIE system had already been recognized by ONC for being "one of only 10 states to reach ONC's Level 2 milestone, which certifies that they are enabled for direct exchange and individual users are enabled for full query-based exchange" while Alabama had been recognized at the same time by ONC only for achieving a Level 1 milestone which certified that users were enabled for direct exchange. [5] While recognizing that WV had started earlier, HCOP wanted to know why Alabama had not been able to piggy back onto lessons learned from the WV experience to achieve faster progress. The explanation for the different rates of progress was that Alabama had made a design decision to achieve maximum exchange of structured clinical data among participants while West Virginia, which has fewer providers, had chosen a faster development strategy which allowed some clinical data to be exchanged between providers in an image format somewhat analogous to a FAX. Thus physicians at a WV hospital would be able to read information from another hospital or physician but the information could not be fed into the receiving hospital's own EMR database for convenient display, storage or analysis. Alabama, in contrast, contracted to build a system where information would be exchanged in a structured database format that could be merged from the sender's

EMR into the receiver's EMR. This approach lengthened the development time of Alabama's system by requiring more programming by the HIE developers but it had the potential to create a longitudinal patient record that could be displayed in a more integrated fashion and analyzed. The lesson to be learned from this comparison of two otherwise similar systems is that an implementation timetable is affected by the degree to which the HIE system incorporates structured clinical information.

Implementation of DIRECT Secure Messaging

Connections within Alabama

Alabama Medicaid established a tool within its Health Information Exchange for provider-to-provider secure messaging in February of 2012. [6] The Web portal featuring Direct Secure Messaging (DSM) or DIRECT exchange will facilitate the MU Stage II requirement among Alabama hospital and office-based providers for securely exchanging summary of care documents (Provider Priority Area 3) during transition of care or with referrals from one provider to another. Since the time that the DIRECT tool was first released, 400 Alabama providers enrolled to participate (Medicaid, August 2012). The State has since launched a DIRECT recruitment campaign statewide.[7] In particular, the DIRECT engagement efforts are currently targeting a pilot site in East, Alabama where Care Network of East AL, Inc., a 501-c organization, operates one of four active community-based networks in the State that support primary medical providers (PMPs) among Alabama Medicaid's Patient First eligibles. Selection of this Pilot site for office-based and other healthcare providers could prove advantageous given the close working relationships established since 2011 between Network physicians and hospitals and the Network Professional Staff such as the Medical

Director, Pharmacists, Nurses, Case Managers and Behavioral Health Specialists. Providers who sign up for DIRECT follow a series of standard registration steps such as reviewing OHR policies and procedure documents and signing a participant agreement, a business agreement, and a qualified services organization agreement. Once enrolled the State team offers system administrators within practices a training on the web account and DSM as well as a site visit for follow-up to assist with any issues or concerns and to monitor progress using the Web portal.

In speaking with hospitals that are approaching a 'live' connection with One Health Record, one Information Services Officer shared that the hospital's EMR and associated physician practices' EHR systems also offered a secure messaging feature and that instead of using the Exchange to send summaries of care securely to other providers they will use their native application. Thus for the institutions that have purchased well-integrated EHR or EMR systems, their summaries of care will be generated internally rather than using the Directed exchange option. However, providers in Alabama who do not yet have an EMR/EHR installed within their facility or their system cannot interface with the Health Information Exchange now have the option of querying Alabama's One Health Record for historical data on their new or existing patients.

Connections with Florida and Georgia

In March 2013, The Florida Health Information Exchange announced that it had established Direct Secure Messaging Service with systems in Georgia and Alabama. [8] Through this national standard connection, providers in each of the three states are able to send encrypted messages across state lines to colleagues who have registered for

the service in their respective states. The connectivity is expected to be important for residents who live near state borders who may cross over for health care services.

2. Experiences among Hospitals as Early Adopters to the HIE System

Methodology

HCOP conducted structured interviews either by phone or in person with senior leadership such as the Chief Operating Officer (CEO), Chief Information Officer (CIO), Chief Medical Officer (CMO) and Chief Nursing Officer (CNO) of the first 5 hospitals that connected to the AHIE. The Director of Health Information Technology at Medicaid announced to the four primary hospitals identified as 'HIE early adopters' that HCOP would be conducting an evaluation of the HIE on behalf of the Agency and its partners and then provided HCOP with the direct contacts at these institutions. Hospitals were contacted starting early in November 2012 and all hospital representatives were receptive to our interview recruitment efforts. The phone interviews were conducted between November of 2012 and January of 2013 with Jackson Hospital in Montgomery, Baptist Health with three hospital facilities in Montgomery and Prattville, East Alabama Medical Center in Opelika, and the UAB Health System spanning multiple facilities throughout the metropolitan area in Birmingham. Among these four hospitals we spoke with one CEO, one CIO and one VP for Information Services and Application Support and three Directors of Information Services and Systems, one of which was a Nursing executive.

Alabama Hospitals Exchanging Test Data:

Alabama Hospitals	**Anticipated HIE *GO LIVE* Dates**
Jackson Hospital, Montgomery, AL	Spring 2013
East Alabama Medical Center, Opelika, AL	Spring 2013
Baptist Health System, Montgomery, AL	Spring 2013
UAB Health System, Birmingham, AL	Spring 2013

Questions included in the structured interviews followed the updated conceptual framework of DeLone and McLean regarding information quality, system quality, service quality, use and intention to use, user satisfaction and net benefits to the individual user and the organization. [9] Questions of interest included the following.

- What is the current status of your connection to the Alabama Health Information Exchange?
- Why did your hospital decide to be an early participant with the AHIE program?
- What overall benefits does your organization expect to derive from using the AHIE? What advantages do you anticipate for your hospital once it is accessing the patient data in OHR?
- Challenges encountered with preparing to join the system.
- Experience with getting the hospital information infrastructure ready to join the State health exchange.
- Costs associated with these technological and infrastructure readiness efforts. How much did the HITECH subsidy payments help with the initial expenditures incurred?
- Experiences with getting initial and ongoing support from and collaborating with the Alabama exchange team, the Regional Extension Center, and the contracted HIE vendor. Who will typically query the AHIE within your organization? Physicians directly? Nurses? Front desk or other provider supportive staff?
- Will your EHR system or Truven's HIE be able to generate utilization reports to monitor use and appropriate access of patient records as well as to analyze the types of queries being made by providers and other clinic staff?
- Given your organization's experience from connecting to the HIE, what advice would you give to other hospitals that are going to connect in the future?

The semi-structured interviews covered these types of questions as a guide while remaining open to follow the flow of a two-sided conversation and the particular issues that were raised by participants. Interviews were recorded and transcribed verbatim. *Ad hoc* follow-up was proposed to cross check the opinions expressed during the various interviews in the event that direct attributions were made in reporting.

The phone interviews among these six participants lasted from 38 minutes to over an hour. Each interview session was recorded for the purposes of retaining verbatim details and experiences described by hospital representatives and recordings were later fully transcribed by the HCOP team. Transcribed documents were processed primarily using NVivo 9.0 software used to support qualitative and mixed methods evaluations. Coding in NVivo provided broad categories or 'nodes' of responses based on the dialogues imported into the software system. Further data processing in NVivo revealed offshoots or 'branches' within these overall categories and more closely identified themes across the breadth of the lengthy interview scripts. Naturally, the coding followed the areas pre-defined by the interview guide used: General status of connections to the Exchange, Decision to participate in the AHIE program, Implementation process and experiences, and perceived use once the hospital is actively accessing patient data.

The finding of these interviews with representatives from four Alabama pilot site hospitals are presented here to target commonalities among the six representatives interviewed.

Interview Results

AHIE Connectivity Status

At the time that these interviews were conducted all four institutions were actively exchanging test data between their systems and the Alabama exchange system. Jackson Hospital reported that they were then in a "successful test mode". UAB Health System was exchanging test data and was confident that the Cerner Millennium system

they installed would connect to the HIE and provide the other Alabama hospitals with a CCD about their patients who were treated at UAB. EAMC had established a database within their system to hold their patients' data. EAMC had hired the HIE subcontractor, Care Evolution, to assist them with connecting to the HIE. A preliminary batch of patient data from the AHIE had been loaded into the EAMC central database and they were being compared to the data in their EMR. Jackson Hospital was transmitting Admit-Discharge Transfers (ADTs) for their patients, specifically patient demographics, to an intermediary system Relay Health. One Heath Record was receiving that Patient Identifier Cross Referencing (PIX) data contained in the CCDs created by the Relay Health system. Baptist Health was also exchanging test data. From our discussions it appeared that Jackson Hospital and East Alabama expected to be connected to the AHIE in the spring of 2013.

Decision to Participate in the HIE and Expected Benefits

Overall, the interviews revealed that all of these hospitals saw the HIE program as a way to enhance continuity of care for their patients and the patients of other providers statewide. For physicians and nurses in the emergency department, the HIE was expected to offer easy access to accurate, current information on medication history, allergies, previous surgeries performed and other pertinent treatments administered elsewhere so as to improve their ability to provide the best care to patients. An example described was the status quo when new patients visit an ER: every time a patient enters the ER, the physicians and nurses are at 'ground zero' and they have to re-create the patient's history in order to determine their strategy for

treatment even though this history might be available at another facility just across town where the patient had also recently been treated.

Another hospital official stated that establishing a health information exchange within Alabama where there will be one view of a patient's record is 'just the right thing to do' because any patient might be treated at some time at any hospital in the state. Also mentioned was the hope for the hospital and its providers to be better 'stewards' of the public insurance funds in Alabama through reduced or more precise testing and procedures, and avoiding adverse events, for example, with prescribed medications.

Among the early hospital adopters we interviewed, one representative stated that their institution decided to participate as a pilot site for the AHIE because their senior leadership had a vision of an integrated HIT for making patient data available within the local and state healthcare environment. Given the chain of events that occurred with the HITECH and Affordable Care Acts which streamlined funding for the State system and created incentives for eligible hospitals to participate, participating in the HIE was a natural next step for their institution.

One Director of Health Information Systems from a large institution clarified that they expect to primarily be an exporter of patient data to other hospitals around the state because many of their patients return to their home communities for ongoing and follow-up care; in this sense joining the AHIE was viewed as a 'goodwill' effort toward those patients.

Finally, all participants stated the need to be ready for Stage II compliance with Meaningful Use and the need for an HIE connection to send patient summary of care

documents for transition of care. They emphasized that the HIE was the only way that hospital providers could meet this ONC requirement.

All hospital officials recognized that improving patient care as a result of having a holistic view of patients' medical histories at the time of their current visit would be a major advantage for the hospitals treating them – '[having] the right information in front of [providers]'. Another advantage for the majority of these hospitals would be the opportunity to import data from other local hospitals and from larger institutions where their patients go for specialized and critical care procedures. Another key motivation for being an early adopter of the HIE was the ability to receive subsidies from ONC as soon as possible by demonstrating the capacity to exchange clinical summaries of care on their patients.

Among our sample of early adopters, one health information director from a large Alabama hospital indicated that they have already achieved integration within their own system which allows all clinical providers to access patient data from the emergency department to multiple hospital departments and even to the associated outpatient clinics and physician-based practices. Connection to the AHIE would allow a similar integration of information for patients referred or transferred from other provider. Representatives from other pilot hospitals expected that once the HIE was implemented throughout the State their providers across many outpatient, inpatient and emergency and acute care facilities would be onboard to access the information shared statewide when their patients returned from other facilities for further treatment.

All respondents stressed the importance of having the AHIE achieve a critical mass of participants so that the available data would be as comprehensive as possible.

Once institutions and healthcare providers realize the value of the HIE, it will eventually become ubiquitous and then essential to the Alabama healthcare system. This would be true for both hospitals and for physicians' offices.

Experiences with Preparing to Join Internal System(s) to the AHIE

The officials at the hospitals that we interviewed had varied experiences in preparing their systems to join the AHIE. Most of them felt that the roll out of the AHIE was going much slower than they would have liked, hoped or expected. Although the officials interviewed were satisfied with the level of collaboration and ongoing support from the State agency and Truven, they recognized that the process was well behind the initial schedule for full connectivity and utilization. Some of the causes for delay were the following.

- Consultants had to be hired to train healthcare staff. This applied mainly to physicians and nurses. Some of the training had to do with using the hospital's EHR and some had to do with additional training regarding use of the HIE to seek data in the AHIE system.

- Vendor lack of maturity. Some vendors had developed EHR systems that focused on data needs within the hospital but the vendor seemed to have not given much effort to connecting with the AHIE or to exporting formatted CCDs into the AHIE system. One hospital found that its EHR would be able to read data from other hospitals that also used the same EHR product but for queries to other hospitals it would have to separately log into the AHIE's own web page. This problem also existed for Public Health reporting. Thus there was a smooth access to data within a vendor's own product line and an awkward access to the rest of the AHIE system. Another hospital reported that it had to modify its EHR to alert users to the fact that additional data on a particular patient was available in the external AHIE system. Specifically stated were vendor lags in developing an interface between the existing EMR and the HIE and developing the capacity within native applications to create a continuity of care document to send to the Alabama HIE.

- Policy and Procedures. Two of the six interviewees felt that technically things were going fairly smoothly; however both also stated that there were policy and procedural issues internally that were contributing to delays. One interviewee remarked that it was essential that board members, senior administrators and other key stakeholders within the organizations be fully educated on the implementation of the HIE and its expected benefits internally in order to gain buy-in and support for these efforts. Additionally it was critical to clarify the hospital's strategy to inform patients about the health information system in which their patient history would be shared and how the hospital would ensure patient confidentiality and privacy for shared information. Another hospital reported that it had few technical problems with connecting to the AHIE. However, its connection to the AHIE was significantly delayed by the need to establish or clarify internal rules about what data would be shared with the AHIE and who in its organization would have permission to access what data. The problem was complicated by the relationship between the hospital, its affiliated physician outpatient group and some independent physician practices. Each of these parties had EHRs from different vendors.

Costs Incurred with Implementation & HITECH

Hospital information specialists and executives indicated that the subsidy payments have been significant and have helped with the upgrade or implementation of an electronic medical record. Representatives from two hospitals confirmed that they had or would have installed these applications within their institutions independent of the incentive payments given the advantages to the organization and benefits for patient care delivery with system-wide integration. One of these hospitals indicated that without the Meaningful Use imperative to avoid the forthcoming penalties in 2015, they probably would not have put so much emphasis and money on bringing their physician practices onboard in such a short period of time; it "forced [their] organization to be ready for that [and] to move at a faster pace" and out of sequence compared to what they would have preferred had there not been such a tight deadline. Two hospital systems reported that they had already made huge investments ranging from several million to more than 70

million dollars toward upgrading their facilities' EMR infrastructure; however the latter will ultimately receive only eight and one-half million dollars in reimbursements from the HITECH program. Several hospitals stated that the initial investments made represented a 'small fortune' and that the subsidies were a 'good payout' toward acquiring the needed EMR and software upgrades and components but the reimbursements were in no way enough to cover the cost of preparing to join the Health

In the case of one respondent, the hospital's vendor had to do additional and extensive programing to develop a working interface that would be compatible with the standards adopted by the HIE. In this particular hospital, it was expected that there would be a 90-day delay in reaching the capacity to consume data from the HIE and bring the patient information from the Exchange into its native application.

Experiences with Getting the Needed Technical Assistance from the AHIE team, the AL REC, and Truven

In general, respondents said they had had good communication with Alabama Medicaid regarding policy issues and technical requirements. One respondent said that it had been necessary "to read very carefully" the technical requirements for interfacing their hospital with the AHIE because there were many fine points about data connection protocols. Respondents also generally thought that Medicaid was very thinly staffed and highly vulnerable if they lost one or two key people. Respondents had also found that Truven, the AHIE contractor, had been generally helpful and responsive. However, two respondents had been confused by the relationship between Truven and its software contractor CareEvolution. As we explain in another section of this report, CareEvolution

writes the computer code for the Truven HIE Advantage software platform and it also independently markets HIE connection software to various EHR vendors and other users. Some of the hospitals that we interviewed had not anticipated that they or their EHR vendor would need to contract with CareEvolution to obtain software to help them connect to the AHIE. One hospital had implemented what they thought was a PIX 3.0 protocol for data exchange which they expected to be backward compatible with a PIX 2.5 protocol defined by CareEvolution for the Truven platform. That hospital had to contract for additional software support to achieve PIX communications. None of the hospitals had used the services of the Alabama REC. They felt that the REC was designed and focused on helping physicians' offices acquired EHR software and that it lacked expertise regarding hospital systems.

Access to and Utilization of the AHIE once Connected

All of the respondents indicated that their EHR systems have various levels of permissions regarding who is allowed to see particular items of information. Their systems can also track who accesses information. Similar permission levels would also apply to information accessible via the AHIE.

Utilization Data, Reporting and Analytic Capacity of Hospital and or HIE System:

All of the respondents indicated that their EHRs were able to generate reports such as "which patients have received drug X on an inpatient basis in the last 30 days" or "how many patients have been hospitalized for condition Z this year". They expected that their connection to the AHIE would allow them to answer similar questions based on data combined from within their facility and across the state. They were not prepared

to speculate on what types of reports might be generated by the HIE system for the state as a whole

Respondents did note that it would be valuable for the AHIE to achieve connections with the HIEs in border states such as Florida, Tennessee, Mississippi and Georgia in order to assist hospitals and physicians who treat out-of-state patients.

Recommendations for Alabama Hospitals that are Anticipating or in the Process of Preparing to Join the AHIE

The individuals that we interviewed offered the following advice to hospitals that are preparing to connect to the AHIE

- Make sure that the hospital board of directors and senior administrators (CEO, COO, CFO, CMO, CNO etc.) are fully briefed on, and agreeable to the enhanced access to data that will occur with a connection to the AHIE. Make sure that there is one message and one game plan that everyone is committed to.
- Work out as early as possible the protocols for data access. How will data from affiliated physicians' practices, nursing homes or laboratories be shared? Determine who has to give permission to whom. Determine who will be allowed access to which parts of the data bases and how access will be documented and tracked.
- Read thoroughly the technical specifications for connecting to the AHIE and transmitting structured information. Do not assume that your EHR vendor has everything covered.
- Determine what changes or enhancements your EHR vendor will need to make to connect your hospital to the EHR and be clear about what charges the vendor will incur and what charges the hospital may incur.
- Determine if your EHR system will be able to seamlessly share information with the AHIE. Will users have to separately log into the AHIE to get information about patients who were treated in facilities not serviced by your EHR vendor?
- Expect that the process of going live will take longer than expected. The exchange of test data will reveal problems sequentially and you will have to solve one minor problem after another rather than having a nice list of problems all at once.

3. Extent of e-Prescribing (PPA1)

Electronic-Prescribing or e-Prescribing (e-Rx) is more than mere electronic transmission of a prescription. It encompasses the secure real-time electronic delivery to providers and pharmacists of patient specific information regarding eligibility, benefits, drug interactions, warnings, dosage and adjustment, medication history and the availability of generics. The system usually involves an electronic hub and a pharmacy benefits manager (PBM). The hub stores master indices that identify providers, pharmacies and patients. After the hub receives a prescription from the provider it typically communicates with the PBM which verifies insurance coverage, determines copayment, checks if the drug is on the insurer's formulary and advises about possible generic substitutions. The PBM's response is routed back to the hub which may then either advise the provider about a coverage problem or forward the prescription to the pharmacy. The pharmacy then fills the prescription and notifies the provider that it has been filled. The hub, the PBM and the pharmacy may each review drug history for clinical contraindications or suggestions of drug abuse. E-Rx is supposed to reduce medication errors and the time that pharmacies might otherwise spend with paper or FAX based systems on calling back to the provider to interpret handwriting, verify dosage, or alert the provider about contraindications. Possible downsides of e-Rx are an increase in false warnings and the mis-selection of drugs with a mouse or cursor when using a dropdown list. Pharmacies and providers also must incur the cost of installing and maintaining their computer interface equipment. An e-Rx system can operate without an HIE but integration with an HIE can potentially increase the benefits and/or lower the costs of both systems.

Surescripts (http://www.surescripts.com/) is a hub that describes itself as "the Nation's E-Prescription Network […that …] connects prescribers in all 50 states and the District of Columbia through their choice of e-prescribing software to the nation's leading payers, chain pharmacies and independent pharmacies". Surescripts reports that Alabama ranks 35th among the states on a composite index that measures "each state's progress in advancing healthcare safety, efficiency, and quality through the adoption and use of e-prescribing…based on volume of use for all three prescribing services: Prescription Benefit, Medication History and Prescription Routing.

Highlights from the Surescripts report for Alabama for the years 2010, 2011, 2012 [10] respectively shows the following:

- The percent of Alabama community pharmacies with e-prescribing activated has been rising over the three years from 87%, 92% to 94% respectively;
- The percent of physicians routing prescriptions electronically (not counting preauthorized refills on existing prescriptions) has been rising rapidly with 24%, 55%, 68% respectively;
- Total prescriptions routed electronically has been steadily increasing from 3.8 million, 7.4 million to 13.1 million;
- The percent of patients with available prescription benefit history information has fluctuated with 68%, 56% and 74%;
- The percent of patient visits involving a prescription benefit request has been 27%, 44% and 77%;
- The percent of eligible prescriptions routed electronically has been steadily increasing from 12%, 22% to 37%.

Discussion in the Surescripts national report indicates that national chain pharmacies have universally embraced e-prescribing and that the vast majority of independent pharmacies are now seeing enough e-prescribing volume that nearly all will soon embrace this capability. Previous analysis by Alabama Medicaid for 2010 found that 32% of pharmacies that are enrolled to do business with Medicaid are located in rural counties and 68% are in urban counties.[11] If this distribution applies to all pharmacies, then there were approximately 55 rural and 109 urban pharmacies in 2010 without e-prescribing capability. Given the trends in e-prescribing, we expect that this number has decreased.

In the coming year, HCOP proposes to conduct brief structured interviews with the managers of about 15 of these pharmacies (8 rural, 7 urban) to better understand why they have not adopted e-prescribing. Do they anticipate enough e-prescribing volume to encourage adoption? Are there cost or technological barriers? Do they deal with isolated or specialized clients (e.g. largely nursing home patients)? Do they plan to adopt e-prescribing? If so, when?

The Surescripts report also indicates that the percent of physicians who are routing prescriptions electronically has been rising rapidly (from 24% in 2010 to 68% in 2012). This trend is presumably in response to the growing use of EHRs in physicians' offices which has been encouraged by HITECH incentive subsidies. However one recent national survey of physician practices found that some of the e-prescribing features of EHRs are not fully used because of software design features that interfere with the physician's workflow. For example, some EHRs were perceived to be incomplete or slow to update information regarding medications prescribed by other

physicians; some were cumbersome to use to determine generic prescription alternatives.[12] To understand the experience in Alabama, HCOP in the coming year will include questions in the structured interviews with physicians and physician organizations about how EHR design features affect e-prescribing.

4. Clinical Laboratory Electronic Information Exchange (PPA2)

Background

A Clinical laboratory is an entity that does laboratory testing on specimens derived from humans to give information for the diagnosis, prevention, treatment of disease, or impairment of, or assessment of health. Under the authority of the Clinical Laboratory Improvement Amendments (CLIA) of 1988, the Centers for Medicare & Medicaid Services (CMS) have primary responsibility for financial management operations of the CLIA program. The categorization of commercially marketed *in vitro* diagnostic tests under CLIA is the responsibility of the Food and Drug Administration. The CDC sets standards for laboratory test performance and inspections. State health department agencies conduct on-site inspection surveys of more than half (56%) of the clinical laboratories that conduct moderate and high complexity tests. Laboratories that conduct high complexity tests can elect to be surveyed by one of 6 accreditation agencies such as the College of American Pathologists and the Commission on Office Laboratory Accreditation (which primarily accredits physicians' office laboratories). [13]

CMS classifies labs into 28 categories based on the type of facility in which they are located. Hospital labs, independent labs and physician office labs account for the preponderance of day-to-day clinical lab test volume. For the purpose of certification, CLIA requires all laboratories to apply for one of the four types of certificates depending on the complexity of the tests that they perform. **Accredited** labs perform the most sophisticated and complex tests and they must participate in a proficiency testing program sponsored by one of the 6 accreditation agencies. **Certified** labs perform test

of intermediate complexity, **Microscopy** labs mainly do microscopic analysis of tissue, urine or blood, and **Waivered** labs perform relatively simple tests using kits that require minimum human intervention or technical skill. The numbers of laboratories in Alabama according to type and certification group are shown in Table 4-1.

Table 4-1 Clinical Laboratories in Alabama by type and certification

No. of labs in Alabama (count)	Accreditation	Certification	Microscopy	Waiver	Total
Ambulance	--	--	--	8	8
Ambulatory surgery center	1	--	--	37	38
Ancillary test site	14	1	6	18	39
Assisted living facility	--	--	--	58	58
Blood banks	3	1	--	3	7
Community clinic	14	2	30	66	112
Comprehensive outpatient rehab	--	--	--	1	1
End stage renal disease dialysis	--	1	1	141	143
Federally qualified health center	3	3	18	26	50
Health fair	--	--	--	6	6
Health maintenance organization	--	--	--	1	1
Home health agency	--	--	--	147	147
Hospice	1	--	--	115	116
Hospital	109	23	2	27	161
Independent	21	65	--	44	130
Industrial	--	--	--	38	38
Intermediate care facility	--	--	--	1	1
Mobile lab	1	1	--	6	8
Pharmacy	--	--	--	23	23
Physician office	183	381	554	1039	2157
Other practitioner	2	--	3	23	28
Prison	--	1	--	22	23
Public health laboratory	1	2	1	--	4
Rural health care clinic	1	2	5	35	43
School/student health services	--	--	6	12	18
Skilled nursing/ nursing facility	--	1	--	207	208
Tissue bank/repositories	--	--	--	--	
Others	15	19	12	287	333
TOTAL	369	503	638	2391	**3901**

Source: CMS OSCAR database, accessed April 2013

In principle, all clinical laboratories generate information that could be of value in the comprehensive longitudinal medical record that an HIE seeks to create. For example, a lab in a dialysis facility would routinely track a patient's anemia status and such information could be valuable if available to accompany an emergency department admission. A similar case could be made for having an HIE capture tests done in long-term care facilities. However, because many labs in specialized facilities do not yet have EHRs or even equipment that can generate exportable electronic results, incorporating their information into an HIE is currently a low priority. Of much higher priority is the capture of information from hospital labs and independent labs because they often act as "reference labs", that is, they receive specimens from various health care providers and report back the results. Hospital labs may test not only inpatients and outpatients in their own facility but also the patients of other physicians in their local area. Independent labs often receive specimens from both hospitals and physicians' practices and in some cases an Independent lab may operate one or more centralized facilities that receive specimens from around the nation. The ability of these hospital and independent labs to transmit information back and forth in an electronic form that can be incorporated into an EHR is thus a matter of high interest.

Under CLIA, laboratories are licensed and subject to inspection based on the location of a physical facility and the complexity of the tests that it performs. Labs that perform tests of high or moderate complexity are inspected approximately every 2 years. Waivered labs are rarely inspected. The logic of inspecting physical facilities is much like the inspection of restaurants for cleanliness by a health department: individual restaurants are inspected regardless of whether they belong to a national franchise.

For the purpose of learning about a laboratory's ability to receive and transmit clinical data, it may be more efficient, however, to take advantage of "chain" status rather than to make separate inquiries to each franchise site. For example, national laboratory corporations such as Quest Diagnostics have in Alabama dozens of licensed laboratories that provide services to doctors and hospitals in a particular area. These labs often have similar equipment, operating procedures and communication protocols linking them into the corporate network. A local lab manager may have a rough idea of how much test information is exchanged with providers via mail, courier, FAX or a computer link but exactly what protocols are used is knowledge that is more likely to reside at corporate headquarters.

Recently ONC announced that it will soon conduct "The National Survey on Health Information Exchange in Clinical Laboratories," a national sample survey of approximately 12,000 hospital and independent laboratories to learn about electronic laboratory information exchange capacity and activity at the state and national level. [14] This survey is sponsored by ONC and conducted by its national evaluation contractor National Opinion Research Center (NORC) at the University of Chicago. ONC's announcement states that the survey will include "information on laboratory information exchange, including the volume of test results sent electronically, adoption of standards, current information systems used, and barriers and facilitators for exchange." ONC states that the survey findings will be used to develop a comprehensive understanding of the baseline level of laboratory information exchange. This information will inform program activities and policy efforts to promote laboratory information exchange and provide more targeted assistance to states in developing

their laboratory information exchange strategies. Ultimately, the data and results will guide ONC and other federal agencies on future policy for laboratory information exchange. It is not clear from the announcement if the sample size would be sufficient to permit estimates of electronic information exchange at the level of specific states or HIEs. The proposed survey, however, may be an excellent template for ongoing monitoring that the CDC might wish to conduct in the future.

Laboratory Surveys in Alabama

The AHIE has had considerable difficulty in obtaining information about the electronic communication capabilities of clinical laboratories in Alabama. In support of the original work plan of the AHIE, Tuskegee University developed a survey instrument in 2012 to be used to gather baseline information regarding the current and planned adoption and implementation of structured lab data exchange by in-state laboratories. Medicaid identified 630 laboratories currently providing services to the Alabama Medicaid Agency. This included: 385 physician office labs (POLs), 100 public health agency labs, 105 hospital labs, 32 independent labs, 7 advanced nurse practitioner practices with labs, and 1 dialysis center lab.

Among the available list of 32 independent labs, three were duplicates and numbers for two labs could not be identified leaving 27 viable contacts for baseline survey recruitment. In addition, one wrong number was identified, nine labs contacted chose not to complete survey, recruitment messages were left with eight labs, two labs could not determine the person to speak to, one lab indicated that its IT department was located in another city, another lab contacted had only one staff member who was

scheduled to receive training on electronic transmission of results in the future and one lab on the original recruitment list did not process lab specimens. Only four labs completed the survey out of 27 labs contacted or attempted to contact for a 14.8% response rate among independent labs in the state.

Three out of the participating four (75%) independent labs indicated the capability to report test results electronically. The remaining lab was still using postal mail and did not have the capability to receive lab orders electronically. The three labs capable of transmitting results electronically reported various barriers to electronic communications. One lab stated that it was costly to interface with providers who were themselves interfacing with more than 200 clients. Presumably this applies to an independent lab that was servicing a hospital which was in turn servicing physicians' practices. HIPAA compliance was also identified as a barrier without further explanation. Another barrier was health care providers who lacked e-lab abilities within their practices. For the lab that was without electronic capability there was a six-month to one-year timeframe for implementation. Two labs reported resources that would be further needed to facilitate a more comprehensive electronic reporting system such as new computers, HIE software, training for lab personnel, a broadband internet connection and additional lab personnel.

Upon completion of the initial survey, the scope was increased to include all labs within the state of Alabama including hospital labs and physician labs, respectively. Among these additional hospital- and physician office-based labs, 351 direct recruitment contact attempts were made and surveys were completed by only 10 labs (a 2.8% response rate). There were several key problems with attempting to reach the labs in

the state: either the phone numbers were no longer in service or were incorrect, there was no answer when called back (3 attempts per lab), when a call back was requested upon leaving voice messages no further contact was received and several labs were no longer in business whereas others among those reached refused to participate. The results from the survey are in Table 4-2.

Table4-2

Survey response	% of labs	No. of labs
Reporting test results electronically	50%	5
Receiving lab order electronically	40%	4
Ability to submit lab data electronically	30%	3
Ability to transmit lab data electronically	20%	2
Ability to submit electronic eligibility information	10%	1
Ability to receive electronic eligibility information	20%	2
*Ability to exchange electronic eligibility information with all choices	20%	2
No barriers to reporting lab data electronically	60%	6
** Facility reported all the data contained in the lab report	80%	8
***Facility responded 'not applicable' when asked, "If the facility is **not** currently transmitting test results/diagnostic results electronically, what is the timeframe for implementation?"	60%	6

*Medicaid, Medicare, Blue Cross Blue Shield, Humana, United Health. One (10%) lab indicated Blue Cross/Blue Shield only; seven (70%) indicated none

**Name of patient, Age/ DOB of patient, Patient address, Sex of patient, Pregnancy status, Race/Ethnicity of patient, Medical record number, Lab reference number, Specimen number, Ordering physician/agency name, Ordering physician/agency address, Test name, Date of test, Types of specimen, Preliminary report, Final report. One (10%) indicated none, and one (10%) excluded sex, pregnancy status, and specimen number

***One (10%) indicated before 2014, one (10%) indicated 6 months to 1 year; one (10%) is ready; one (10%) software installed

A follow-up survey was conducted by George Washington University (GWU) under contract to Alabama Medicaid between February 13th and March 1st, 2013. Only labs

that responded to the baseline survey in 2012 were recruited for the 2013 survey. The exact same survey instrument was administered for follow-up as that used at baseline. Attempts were made to contact fifty-four independent labs and forty-nine hospital labs. The survey was conducted entirely online using the popular system Survey Monkey; however labs were also contacted by phone when e-mail addresses had not been provided at baseline. Sixteen hospital labs and nine independent labs completed the follow-up survey online.

When asked "During calendar year 2012, did your laboratory send lab results to ambulatory providers outside your organization electronically[1] in a structured format[2]?" the responses included the following:

Table 4-3

Sent lab results electronically in 2012?	Independent labs		Hospital labs	
Answer choices	%	n	%	n
Yes	33.3%	3	31.3%	5
No	55.6%	5	62.5%	10
Don't know	11.1%	1	6.2%	1
Total	100.0%	9	100.0%	16

[1] By "electronically" we mean any computerized exchange typically transmitted over the internet or through a network, using health information technologies such as electronic health records and direct access via a lab portal. Please do not include fax machines.

[2] By "structured format" we mean documentation of results using computer readable formats with predefined vocabulary that creates fixed fields within a record or file

The survey asked about laboratory's practices on a standardization of lab results. The responses in Table 4-4 refer to "LOINC[3]". Table 4-4 shows the proportion of test results that a laboratory sent to ambulatory providers outside their organization following LOINC standards during calendar year 2012.

Table 4-4

% sent via re: standards	0%	1-24%	25-49%	50-74%	75-99%	100%	Don't Know	Total
Independent labs	77.8% (7)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	22.2% (2)	100% (9)
Hospital labs	56.3% (9)	0% (0)	12.5% (2)	0% (0)	6.3% (1)	12.5% (2)	12.5% (2)	100% (16)

(#) indicates number of labs

The Lab Results Interface (LRI) guide is the implementation guide developed by the Office of the National Coordinator (ONC's) Standards and Interoperability Framework LRI initiative. The survey asked a question regarding the implementation of the LRI guide among labs. When the laboratories were asked if they implemented the LRI guide for lab result content and format, the responses were as follows:

Table 4-5

Implemented LRI guide?	Independent labs		Hospital labs	
Answer choices	%	n	%	n
Yes	11.2%	1	0.0%	0
No	44.4%	4	43.8%	7
Don't know	44.4%	4	56.2%	9
Total	100.0%	9	100.0%	16

Although Tuskegee and George Washington University surveys attempted to gather both baseline and follow-up data for Alabama Medicaid, they were not very successful in contacting an adequate sample of laboratories in Alabama which is evidenced by the poor response rates for the survey. Also, the baseline survey and

[3] LOINC (Logical Observation Identifiers Names and Codes) is a terminology used to provide consistent naming of datasets that includes standard codes for lab test names; for example, "Test name: Salmonella Stool Culture LOINC Code: 20955-1."

follow-up surveys were not matched sufficiently to allow for any direct reports on changes in implementation or electronic reporting and therefore are not comparable.

Conclusion

Alabama Medicaid has had difficulty in surveying clinical laboratories to learn about their electronic communication capabilities. Attempts to survey laboratories by telephone and internet have achieved low response rates. Possible reasons for poor response rate appear to be the following:

- Contact list and information for the labs was not available for the appropriate response level.
- There was no obvious incentive or perceivable benefit to labs to participate in the AHIE survey.
- Lack of a national imperative for Alabama labs to respond made recruitment efforts on the part of Tuskegee and GWU difficult.
- Local lab directors may not understand the technical details of how their laboratory communicates electronically with clients. Is a test result in the lab's computer transmitted in LOINC or is it essentially a FAX like image?

One possible solution to this problem may be to have the CLIA Program in the Division of Health Care Facilities in the Alabama Department of Public Health take on the responsibility for collecting information about the electronic transmission capabilities of the laboratories that they inspect. Their inspections occur approximately every two years for labs that do tests of high and moderate complexity. However, they typically do not inspect those "Accredited" laboratories that do high complexity tests that elect to be inspected by one of six accrediting agencies. Obtaining information from those Accredited laboratories could be done efficiently by ONC working on a national basis with the Accrediting Agencies. An alternative approach might be for ONC to undertake a statistically valid sample survey of clinical laboratories. Recently ONC has begun such a

survey on a pilot basis for hospital and independent laboratories. We recommend that further attempts at surveying laboratories by telephone or internet be suspended pending results of the national survey. Ideally, a periodic national survey with a sufficient sample size to make state level estimates would provide ONC with what it wants to know.

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Appendix 1

Interview guide: Hospitals – Early Adopters

Evaluation of the Alabama Health Information Exchange (HIE) Program

Preamble

Hello _____, Thank you for agreeing to speak with us. My name is Stephen Mennemeyer; I am a professor in the School of Public Health at UAB. With me is Sally Engler, the project manager for this evaluation. As you know from the email that you received from Alabama Medicaid, UAB has a contract with Alabama Medicaid to conduct an evaluation of the Alabama Health Information Exchange (AHIE) known as One Health Record. The purpose of this evaluation is to give to Medicaid and to the Office of the National Coordinator (ONC) an assessment of how well the AHIE is working, what problems may have been encountered in implementing the system and how well it is meeting expectations for linking together health information. Our evaluation is one of many that are being conducted for each of the HIEs in the US. These individual evaluations will all feed into a national evaluation study that is being conducted by an independent contractor, the National Opinion Research Corporation (NORC) at the University of Chicago. UAB's goal in doing this evaluation is to develop a set of "Lessons Learned" that can help guide the further development of HIEs across the country. We will be discussing with you the topics contained in the interview guide that we previously sent to you by email. [Confirm that this material was received.] Our editorial policy in reporting on our interview with you and other HIE users is one of "soft attribution". That is, we will usually report our findings with phrases such as "a number of senior hospital executives have told us that…" or "one manager at a large urban medical center said…" If we wish to quote you directly with attribution, we ask you to confirm the accuracy of the quote and your willingness to continue to be so quoted. We are interviewing you as the representative of your organization and we expect that what you say will reflect the considered views and experience of your organization in so far as you can express them from your own perspective. You are, of course, free to express your own personal views and observations as you wish. We would like your permission to record this conversation. The recording is not for public distribution but rather to help us maintain an accurate recollection of this conversation. Are you agreeable with our editorial approach and with being recorded? [Clarifying questions and discussion among parties. Recording then occurs with permission.]

Interview guide: Hospitals – Early Adopters

General: How's it going? What is the current state of your connection with the Alabama Health Information system?

I. Decision to Adopt

1. Why did <u>*<hospital/facility name>*</u> decide to participate in the Alabama Health Information Exchange?
    a) Probe: What were some of the factors that the Hospital considered when making this decision?
    b) Probe: What were the concerns for the Hospital prior to agreeing to join the system?

2.What types of advantages do you anticipate once the Hospital is accessing the Health Information Exchange?

a) Probe: Patient care
b) Probe: Information for providers
c) Probe: Information for billing purposes
d) Probe: ED Department's ability to process or treat patients (in a different way given the availability of additional patient information)

a) Background: What Electronic Medical Record system is your hospital using? Brand and Model, etc.)

3.Describe some of the challenges that have you have encountered as a result of preparing to join the State health exchange?

II. Implementation

4.What has been your experience with getting the Hospital's system up to speed technologically to connect to the HIE?

5.Was that process harder than expected?
Please describe.

6.Related to the costs incurred, what types of issues have you faced specifically with implementing the Exchange within your organization? Have subsidy payments under the HITECH Act been sufficient?

7.Please explain your experience with getting the information and support you needed from the Health Exchange Directors and Staff for regarding implementation?

8. Please explain your experience with getting the information and support you needed from the Truven Health Analytics, the designer of the HIE, regarding implementation?

9. Thinking about your own experiences with on-boarding to the HIE, what advice would you offer other hospitals in Alabama who decide to join the information exchange?

a) Probe: What would you have done differently?
b) Probe: What additional resources, if any, might you have needed?

III. Perceived Use

Once the Hospital is fully connected to the Health Exchange, who do you expect to be using it?

a) Probe: Admission staff, Providers, administrative or billing staff? Nurses, Doctors, assistants?
b) Probe: Is your EMR capable of producing reports about how the HIE is being used? Can you track queries by individual physicians? Departments such as the ER?

10. Once the Hospital is fully connected to the Health Exchange, what overall benefits do you expect for the *<hospital/facility name>* itself?

11. Is, will the Truven platform be able to give you utilization information? How will you use the information?

Appendix 2

Interview guide:
Contractor working with AHIE Program

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Interview guide: Vendors working with Alabama hospitals & the AHIE program

➢ Contractor working with AHIE Program:

I. Procurement Process

1. Were you involved in the process by which Alabama Medicaid procured its HIE?

2. Am I correct that Alabama released an RFP and Thomson Reuters submitted a sealed bid?

3. Was the RFP clear and specific about product specifications? About the criteria for award?

4. Did Alabama's RFP contain any requirements that were unusual or difficult to meet compared to other HIE solicitations?

5. Was there further negotiation of price and capabilities after TR was selected? What were the main issues?

6. Have amendments or change orders occurred?

II. HIE Specifications

7. Truven advertises two HIE products: HIE Advantage and HIE Advantage Analytics. What does Alabama have?

8. Can HIE Analytics operate with a federated data system of the kind used in Alabama?

III. Current Status of HIE

9. We understand that 5 or so hospitals are exchanging test data with the HIE but none are ¨live¨ so far. Is this correct?

10. How many hospitals do you expect to go “live” in the next 6 months? ... next 12 months?

11. What are the main obstacles to going live/ ramping on?

12. What is the “partnership with Care Evolution”? What are your respective duties/products/capabilities?

13. When do you expect to be ramping on Physician practices?
    - Clinical Laboratories?
    - Pharmacies?
    - Radiology?

14. What involvement has Truven had with the Alabama REC in regard to ramping on by physician practices?

IV. EHR Vendors

15. How does Truven co-ordinate with EHR vendors? Does Truven offer a ramping on-tool kit or other assistance?

16. What have been your main problems/challenges at connecting with various EHRs? E.G. McKesson, Siemens, Cerner, Cerner Millennium, SuccessEHS,

17. In talking with various hospitals, some report that their EHR software will be able to make inquiries to the HIE rather easily while others think they will only be able to talk to other hospitals that use the same EHR product. Are these perceptions correct and why is this the case?

V. ONC

18. What has been Truven’s relationship with ONC in regard to the development of standards and milestones?

19. Does ONC regularly collaborate with the HIE software industry?

20. Has ONC taken Truven or the industry by surprise with unanticipated standards or requirements?

21. Has Truven had adequate time/opportunity to comment on proposed standards/changes, etc?

VI. Financial Sustainability

22. What do you see as the outlook for the financial sustainability of HIEs?

23. What models of finance are the most promising?

24. What does not seem to work?

25. What is the longer term outlook for the number and configuration of HIEs? Is one big national HIE a possibility? How dependent is the HIE movement on grants from ONC?

26. In particular, what problems/opportunities do you foresee for Alabama?

VII. Effectiveness

27. Academic Studies and evaluations of HIEs to date have not yet found major cost savings from HIEs? To what do you attribute these findings?

28. Are HIEs likely to yield major cost reductions or “only” better care?

VIII. Major Concern

29. What are you or is Truven most concerned about that could go wrong in the future with the Alabama HIE imitative?

IX. Lessons Learned

30. Looking back on the experience of Thomson Reuter/Truven/Care Evolution, what do you wish you had done differently?

31. What advice would you give to other states or HIE organizations?

Vendor contact identification: Is there a HIE Client Director for the Care Evolution side of the partnership that we might also speak with?

If so, who? How can we reach them?

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